



Unexpected Positive Intraoperative Cultures in Aseptic Revision Arthroplasty



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ABSTRACT

Unexpected positive intraoperative cultures (UPIC) in presumed aseptic revision arthroplasty can be difficult to interpret. The purpose of this retrospective study was to compare the incidence of subsequent periprosthetic joint infection (PJI) in patients who received antibiotic therapy according to an institutional protocol with those who did not and whether they meet Musculoskeletal Infection Society (MSIS) criteria for PJI. In patients who were treated with antibiotic according to institutional criteria, the incidence of PJI after revision was higher in those who did not meet MSIS criteria (22%) than in those that met MSIS criteria (14%; $P > 0.71$). UPIC in aseptic revision arthroplasty are not uncommon. PJI cannot be excluded in patients that do not meet MSIS definition.

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Periprosthetic joint infection (PJI) is the most common cause of early readmissions following total knee arthroplasty (TKA) and total hip arthroplasty (THA) [1]. Even during revision procedures for aseptic causes, there is always a concern that prosthetic failure may have been the result of undetected subclinical infection [2,3]. This is particularly important because PJI is a devastating complication of total joint arthroplasty, which requires a different treatment approach compared to aseptic failures [4]. Consequently, current guidelines recommend ruling out PJI in all revision arthroplasty cases by obtaining preoperative inflammatory markers, joint aspiration with synovial fluid analysis and cultures, intraoperative cultures, and soft tissue frozen sections (if available) when infection is suspected [5,6].

While intraoperative cultures have traditionally been considered a fundamental element for diagnosing PJI [7–9], false-positive cultures do occasionally occur [9–13], with reported rates ranging between 3% and 52% [10]. Cultures are also subject to errors in sampling, technique, and potential contamination. Therefore, intraoperative cultures taken during presumed aseptic revision cases which yield a positive result can be difficult to interpret. The time delay until useful results are obtained prevents intraoperative cultures from being a useful decision-making test during equivocal procedures. The Musculoskeletal Infection Society (MSIS) considers the isolation of the same pathogen from two or more intraoperative cultures to be

diagnostic of PJI [14]. Using this definition, the diagnosis of PJI may be made in retrospect after performing a one-stage revision for a presumed aseptic failure [15]. In those cases, PJIs are typically treated with a short-term (i.e., 4–6 weeks) course of antibiotics, with prior studies yielding an infection control rate of 89%–100% [15–17]. Furthermore, when intraoperative cultures return with a single unexpected positive result in a presumed aseptic revision, the decision to treat with antibiotics can be more difficult and somewhat controversial. Prior studies on this topic have suffered from small sample size, and prospective studies are difficult to perform as unexpected positive cultures in aseptic revisions are relatively uncommon [10,18].

In the present study of aseptic revision hip and knee arthroplasty, the purpose was to (1) estimate the prevalence of unexpected positive intraoperative cultures, (2) compare the incidence of subsequent PJI in patients who received short-term antibiotic therapy to treat the unexpected positive cultures and those who did not (i.e., were considered false-positive cultures), and (3) compare the incidence of subsequent PJI in patients who were treated with antibiotics and were deemed PJI-negative or PJI-positive based on retrospective application of MSIS criteria to the unexpected positive culture data.

Methods

This study was approved by the institutional review board. This was a retrospective electronic medical record review of a consecutive series of all revision TKA and THA procedures performed in a single institution between September 1998 and December 2009. The operative notes of all revision procedures during that time were

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This study was approved by the institutional review board (see attached approval letter).

The Conflict of Interest statement associated with this article can be found at <http://dx.doi.org/10.1016/j.arth.2014.07.010>.

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reviewed in order to identify a cohort of revision TKA and THA performed for aseptic indications. Cases of single-stage incision and debridement, two-stage procedures, or procedures with a post-operative diagnosis of joint infection were excluded. Fourteen patients on chronic antibiotic suppression were also excluded. A total of 2594 aseptic revision TKA and THA cases were identified (Fig. 1). Aseptic procedures without intraoperative specimens for cultures ($n = 1054$ cases) were excluded to establish a base cohort and estimate the prevalence of unexpected positive intraoperative cultures, leaving 1540 aseptic revisions with available culture data. Of these, a total of 155 aseptic revisions grew at least one organism on solid media and/or in broth. The follow-up period was considered as the time from the index revision until the last clinical visit or when the patient was diagnosed with PJI. Of the 155 patients, 103 had a minimum of 1-year follow-up or developed PJI in less than a year (mean, 51 months; range, 3–143 months). The final studied cohort consisted of 41 revision TKA (40%) and 62 revision THA (60%). Details in terms of demographics, laboratory results, treatment and outcome are described in Table 1.

Organisms were classified into 4 types: virulent, indolent, fungal and acid fast bacilli, and miscellaneous/contaminants (Table 2). The management of unexpected positive intraoperative cultures was primarily based on the type of isolated organism. According to the personal choice of the infectious disease specialist, patients were treated with short-term (i.e., 4–6 weeks) intravenous or oral antibiotics if at least one of the following criteria was present: (1)

one or more positive cultures for a virulent organism or fungal/acid-fast bacilli; (2) two or more positive cultures for an indolent organism; or (3) one culture positive for an indolent organism with positive perioperative laboratory findings or history of more than two revisions. Positive perioperative findings included elevated preoperative serum erythrocyte sedimentation rate ($ESR > 30$ mm/h) and C-reactive protein ($CRP > 1$ mg/dL) or positive histologic examination of periprosthetic tissue (> 5 neutrophils per high-power field in 5 high-power fields [19]). Of the 103 patients in this cohort, 59 (57%) received short-term antibiotics for 4–6 weeks. Of these 59 patients, 39 (66%) received intravenous antibiotics, 10 (17%) received oral antibiotics, and 10 (17%) received both (Table 1; Fig. 1). The remaining 44 patients were not prescribed antibiotic therapy because they did not meet the institutional criteria. By definition, these patients also did not meet the MSIS criteria for PJI when applied retrospectively. This group of patients is referred to as Group 1 for study comparisons.

MSIS criteria [14] were used to retrospectively diagnose PJI for patients who received antibiotic therapy, and further divided the cohort into groups 2 and 3 (Fig. 1). Group 2 consisted of patients who received short-term antibiotics, but were PJI-negative according to the MSIS criteria ($n = 45$). Group 3 included patients who received short-term antibiotic therapy and were PJI-positive based on the MSIS criteria ($n = 14$). Based on the MSIS definition, a PJI is diagnosed when 1 of 2 major criteria is present (i.e., sinus tract communicating with prosthesis, or a pathogen is isolated by culture from ≥ 2

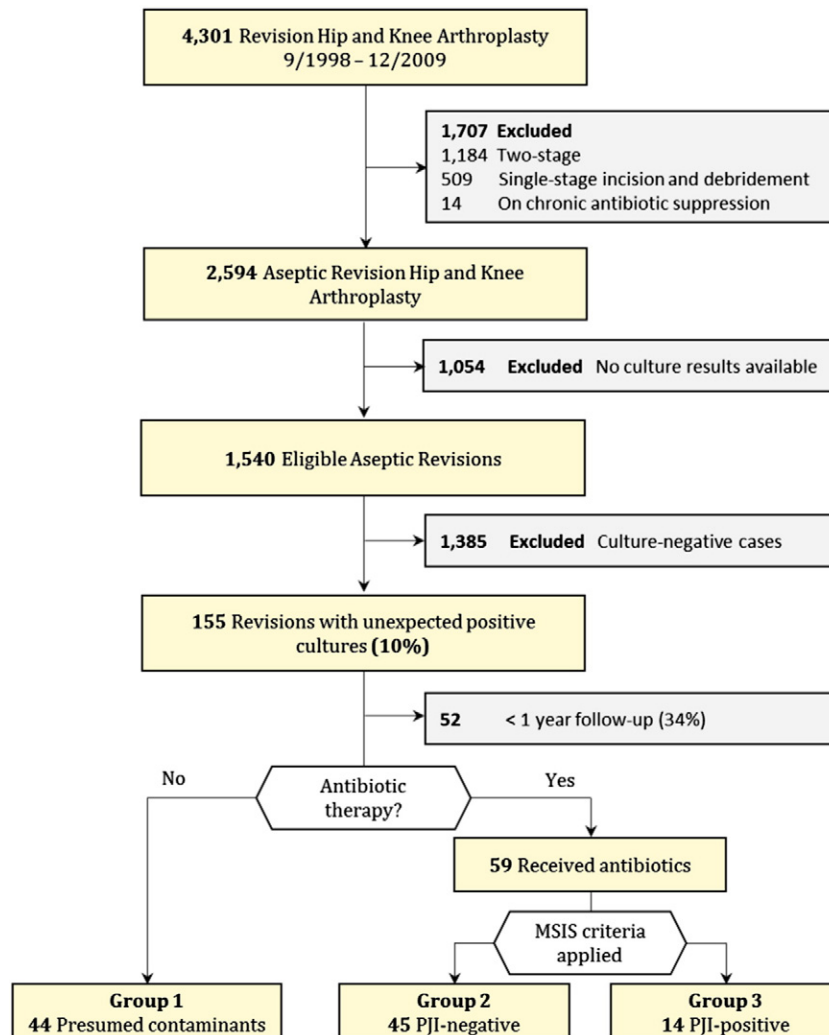


Fig. 1. A flow diagram showing eligible aseptic revisions and number of unexpected positive intraoperative cultures.

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